

WHAT IS CLAIMED IS:

- 1 1. A method of measuring a physiological parameter, comprising:
2 obtaining a first signal derived from electromagnetic energy transmitted
3 through a tissue portion at a first wavelength, said first signal including a signal portion
4 corresponding with motion-related events and a signal portion corresponding with arterial
5 pulsation events, wherein at said first wavelength water is a dominant absorber of
6 electromagnetic energy in the tissue portion;
7 obtaining a second signal derived from electromagnetic energy transmitted
8 through a tissue portion at a second wavelength, said second signal including a signal portion
9 corresponding with motion-related events and a signal portion corresponding with arterial
10 pulsation events, wherein at said second wavelength hemoglobin is a dominant absorber of
11 electromagnetic energy in the tissue portion; and
12 combining said first signal and said second signal to generate a combined
13 signal comprising a plethysmograph, said combined signal having a signal portion
14 corresponding with motion-related events that is smaller than that present in said first signal
15 or said second signal.
- 1 2. The method of claim 1 wherein at said first wavelength water is a
2 stronger absorber of electromagnetic energy than hemoglobin in the tissue portion.
- 1 3. The method of claim 1 wherein at said second wavelength hemoglobin
2 is a stronger absorber of electromagnetic energy than water in the tissue portion.
- 1 4. The method of claim 1 wherein said first wavelength is in the range
2 between approximately 900 and 1850 nm.
- 1 5. The method of claim 1 wherein said first wavelength is in the range
2 between approximately 1100 and 1400 nm.
- 1 6. The method of claim 1 wherein said first wavelength is in the range
2 between approximately 1150 and 1250 nm.
- 1 7. The method of claim 1 wherein said first wavelength is approximately
2 1185 nm.

1 8. The method of claim 1 wherein said second wavelength is in the range
2 between approximately 600 and 950 nm.

1 9. The method of claim 1 wherein said combing comprises applying a
2 multiplier to said first signal to obtain a scaled first signal and subtracting the scaled first
3 signal from said second signal.

1 10. The method of claim 9 wherein said multiplier is a function of the ratio
2 of the absorption of electromagnetic energy in the tissue portion by hemoglobin at said first
3 wavelength to that at said second wavelength.

1 11. The method of claim 1 wherein said physiological parameter is a pulse
2 rate.

1 12. The method of claim 1 further comprising:
2 obtaining a third signal derived from electromagnetic energy transmitted
3 through a tissue portion at a third wavelength, said third signal including a signal portion
4 corresponding with motion-related events and a signal portion corresponding with arterial
5 pulsation events, wherein at said third wavelength hemoglobin is a dominant absorber of
6 electromagnetic energy in the tissue portion; and

7 combining said first signal and said third signal to generate a second combined
8 signal comprising a plethysmograph, said second combined signal having a signal portion
9 corresponding with motion-related events that is smaller than that present in said first signal
10 or said third signal.

1 13. The method of claim 12 further comprising:
2 combining said combined signal with said second combined signal to form a
3 combination; and
4 estimating an oxygen saturation value using said combination.

1 14. An apparatus for measuring a physiological parameter, comprising:
2 means for obtaining a first signal derived from electromagnetic energy
3 transmitted through a tissue portion at a first wavelength, said first signal including a signal
4 portion corresponding with motion-related events and a signal portion corresponding with

5 arterial pulsation events, wherein at said first wavelength water is a dominant absorber of
6 electromagnetic energy in the tissue portion;

7 means for obtaining a second signal derived from electromagnetic energy
8 transmitted through a tissue portion at a second wavelength, said second signal including a
9 signal portion corresponding with motion-related events and a signal portion corresponding
10 with arterial pulsation events, wherein at said second wavelength hemoglobin is a dominant
11 absorber of electromagnetic energy in the tissue portion; and

12 means for combining said first signal and said second signal to generate a
13 combined signal comprising a plethysmograph, said combined signal having a signal portion
14 corresponding with motion-related events that is smaller than that present in said first signal
15 or said second signal.

1 15. The apparatus of claim 14 wherein said means for obtaining a first
2 signal comprise:

3 light emission optics configured to direct electromagnetic energy at said tissue
4 location; and

5 light detection optics configured to receive radiation from said tissue location.

1 16. The apparatus of claim 15 wherein said light emission optics are
2 configured to deliver electromagnetic energy at a wavelength in the range between
3 approximately 900 and 1850 nm.

1 17. The apparatus of claim 15 wherein said light emission optics are
2 configured to deliver electromagnetic energy at a wavelength in the range between
3 approximately 1100 and 1400 nm.

1 18. The apparatus of claim 15 wherein said light emission optics are
2 configured to deliver electromagnetic energy at a wavelength in the range between
3 approximately 1150 and 1250 nm.

1 19. The apparatus of claim 15 wherein said light emission optics are
2 configured to deliver electromagnetic energy at approximately 1185 nm.

1 20. The apparatus of claim 14 wherein said means for combining
2 comprises means for applying a multiplier to said first signal to obtain a scaled first signal
3 and subtracting the scaled first signal from said second signal.

1 21. The apparatus of claim 14 wherein said means for combining
2 comprises a processing device configured to combine said first signal and said second signal
3 to generate a combined signal comprising a plethysmograph, said combined signal having a
4 signal portion corresponding with motion-related events that is smaller than that present in
5 said first signal or said second signal.

1 22. The apparatus of claim 14 further comprising:
2 means for obtaining a third signal derived from electromagnetic energy
3 transmitted through a tissue portion at a third wavelength, said third signal including a signal
4 portion corresponding with motion-related events and a signal portion corresponding with
5 arterial pulsation events, wherein at said third wavelength hemoglobin is a dominant absorber
6 of electromagnetic energy in the tissue portion; and
7 means for combining said first signal and said third signal to generate a second
8 combined signal comprising a plethysmograph, said second combined signal having a signal
9 portion corresponding with motion-related events that is smaller than that present in said first
10 signal or said third signal.

1 23. The apparatus of claim 22 further comprising:
2 means for combining said combined signal with said second combined signal
3 to form a combination; and
4 means for estimating an oxygen saturation value using said combination.

1 24. The apparatus of claim 14 wherein said physiological parameter is a
2 pulse rate.